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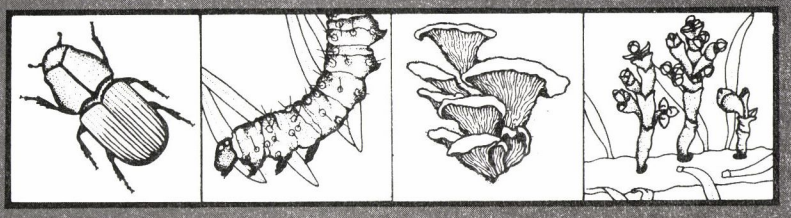

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Report 85-14 April 1985

PERMANENT MOUNTAIN PINE BEETLE POPULATION TREND PLOTS: AN UPDATE, 1985

by

Kenneth E. Gibson

ABSTRACT

This report includes information obtained in both 1983 and 1984. Beginning in 1983, only four of the original six permanent plot locations in the State would be revisited. The two in the southwestern part of the State--Centennial Valley and Madison River--were not visited because of reduced beetle populations and increased logging. No update in 1984 was issued; however, data collected in the remaining plot locations showed Murr Creek to be the only one with significant beetle populations in 1983. There, new attacks averaged 21 per acre compared with just over seven in 1982. In 1984, attacks declined to 6.9 per acre. In the Dunsire Creek area in 1983, attacks increased fourfold to 4.1 per acre, up from 0.9 per acre in 1982. They increased once again in 1984, to 12.4 per acre. No new attacks were recorded in either the Boulder Creek or Spotted Bear plots in 1983. For that reason, those two areas were not visited in 1984. I anticipate monitoring all four plot areas in 1985.

INTRODUCTION

For the sixth year since their establishment, permanent mountain pine beetle trend plots were revisited to record current-year beetle-caused mortality. Two of the areas, those located on the West Fork of the Madison River, and in Centennial Valley, were not visited in 1983. Beetle populations, having apparently peaked in those areas in 1978 and 1979, respectively, were extremely low in 1982 (Gibson 1983). Subsequent logging in both areas resulted in too few remaining plots to make further data collections meaningful. Cumulative effects of the beetle on those plots will be described.

In 1984, plots in the Boulder Creek and Spotted Bear areas were not visited because no new attacks were observed in either area in 1983. Unlike the Centennial Valley and Madison River plots, however, beetle populations have not yet begun to build in those locations. They will be rechecked in 1985. Figure 1 shows the four remaining plot locations.

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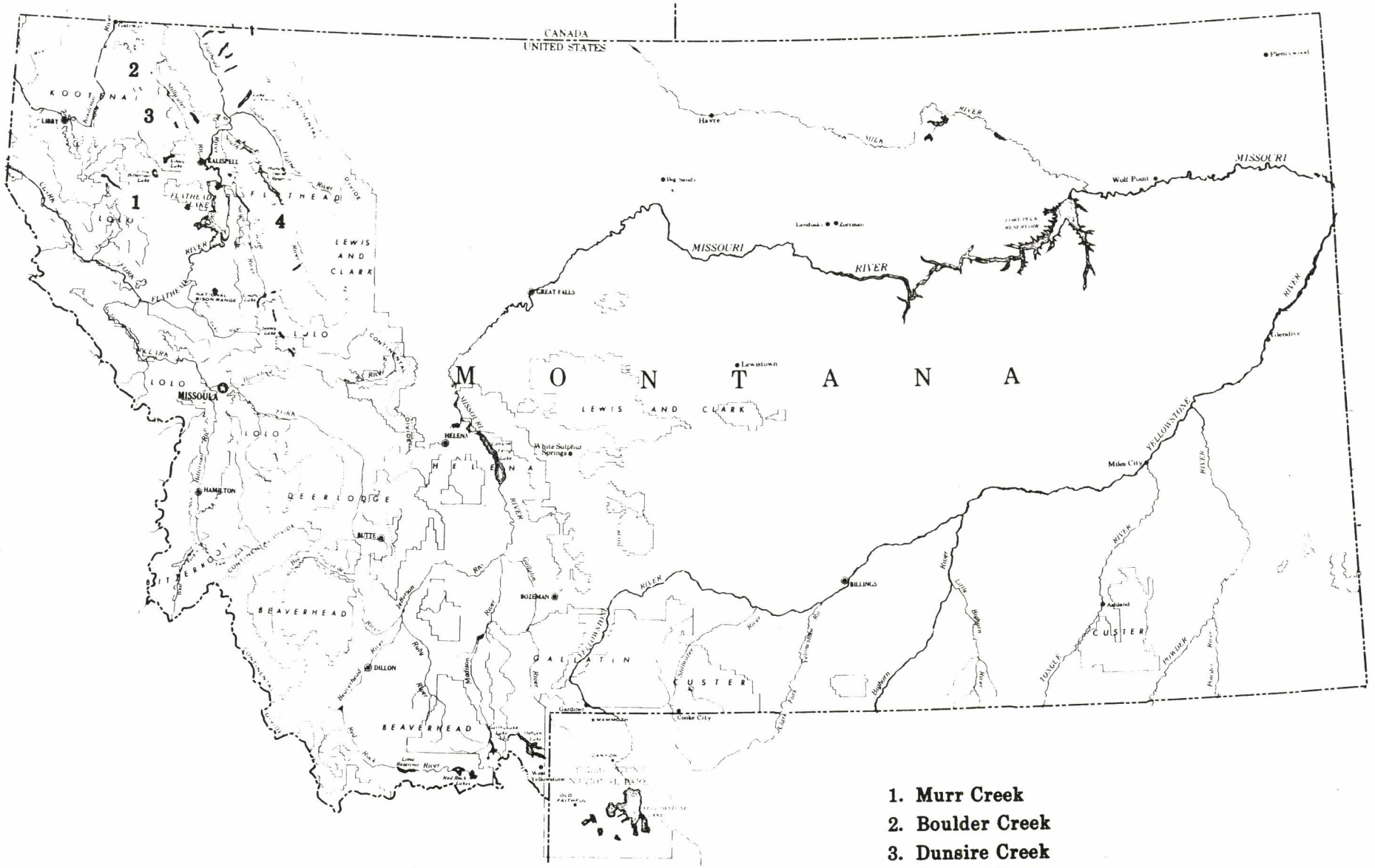


Figure 1. Remaining permanent mountain pine beetle population trend plot locations in western Montana.

The permanent plot areas I visited in 1984--Murr Creek and Dunsire Creek--showed still active beetle infestations. New attacks declined considerably in the Murr Creek area. That infestation may have peaked in 1983. The Dunsire Creek area experienced a continued dramatic increase in numbers of new attacks. That infestation is part of the larger one affecting much of the Tally Lake RD at the present time.

Gibson et al. (1980) described data collection techniques and plot layout in each area. Yearly data collection and analysis remained unchanged.

I am continuing to collect phloem thickness and past 5-year radial growth data on both infested and uninfested trees. Where possible, I took those measurements from one infested and one uninfested tree per plot. In some areas, attacked trees were outside plot boundaries. In others, no newly attacked trees were observed.

DISCUSSION

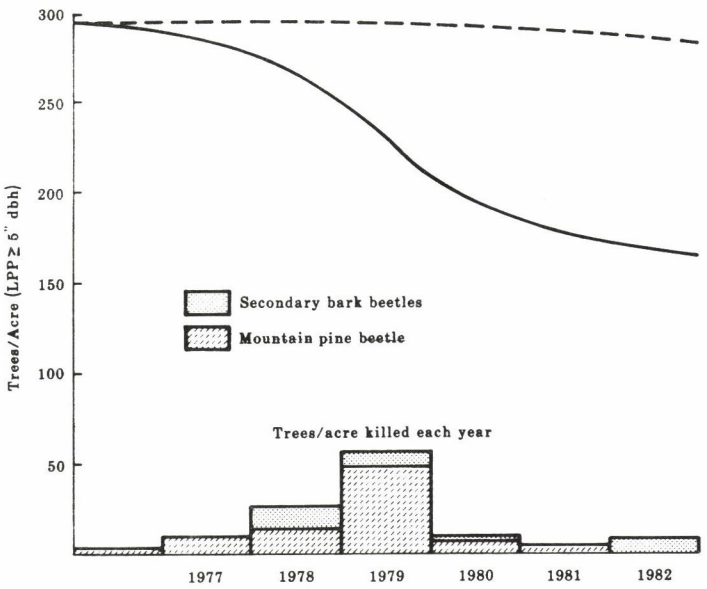
Since the Centennial Valley and Madison River plots are no longer being monitored, it is appropriate to consider the observed cumulative effect of beetles on those stands. In describing total impact, I have included not only the effects of mountain pine beetle, but secondary bark beetles (Ips spp., Pityogenes spp., etc.) as well. Table 1 lists mortality figures as recorded from 1977 through 1984 for all six permanent plot areas. (Plots were established in 1979 prior to beetle flight. "Back-dating" infested or dead trees enabled us to obtain accurate mortality data back to 1977.) For the Centennial Valley plots, newly attacked trees peaked in 1979 at 47.8 per acre. Mountain pine beetle-caused mortality totaled 89.8 trees per acre in the 6 years for which we have data. Secondary beetles killed another 37.4 trees per acre. In the Madison River plots, infestation intensity was never that high. In 1978, 14.9 trees per acre were killed--the highest yearly figure tallied for the observation period. In total, 41.5 trees per acre were killed by mountain pine beetle; another 38.8 per acre were killed by secondary bark beetles. Overall, beetles--both mountain pine beetle and secondary beetles--killed 43 percent of the trees in the original lodgepole component of the stands in the Centennial Valley plots (88 percent of original lodgepole component in board foot volume). In the Madison River plots, 34 percent of the original lodgepole pines--49 percent of the original lodgepole board foot volume--was killed. Figures 2 and 3 graphically represent the effects of bark beetles on those stands. Mortality attributable to secondary bark beetles is considerable when measured in trees per acre. However, when reflecting their penchant for killing smaller diameter trees, that same mortality is nearly negligible when board foot volume is considered.

Tables 2 and 3 list mortality data collected for the four remaining plot areas in 1983 (Murr Creek, Boulder Creek, Dunsire Creek, and Spotted Bear) and the two visited in 1984 (Murr Creek and Dunsire Creek), respectively. As previously noted, no new attacks were observed in Boulder Creek and Spotted Bear in 1983 so they were not checked in 1984. In the Murr Creek plots, attacks decreased from 21.3 per acre in 1983, to 6.9 per acre in 1984. Population trend data collected over the next few years will enable us to determine if the population has begun a genuine decline in that area. To this point, less than 20 percent of the original lodgepole component of those stands has been killed. While more than 250 green lodgepole pine per acre remain, many are in smaller diameter classes. Nearly 130 trees per acre are between 5 and 7 inches d.b.h. Approximately 87 additional trees per acre are predicted to be killed within the next 10 years (Cole and McGregor 1983).

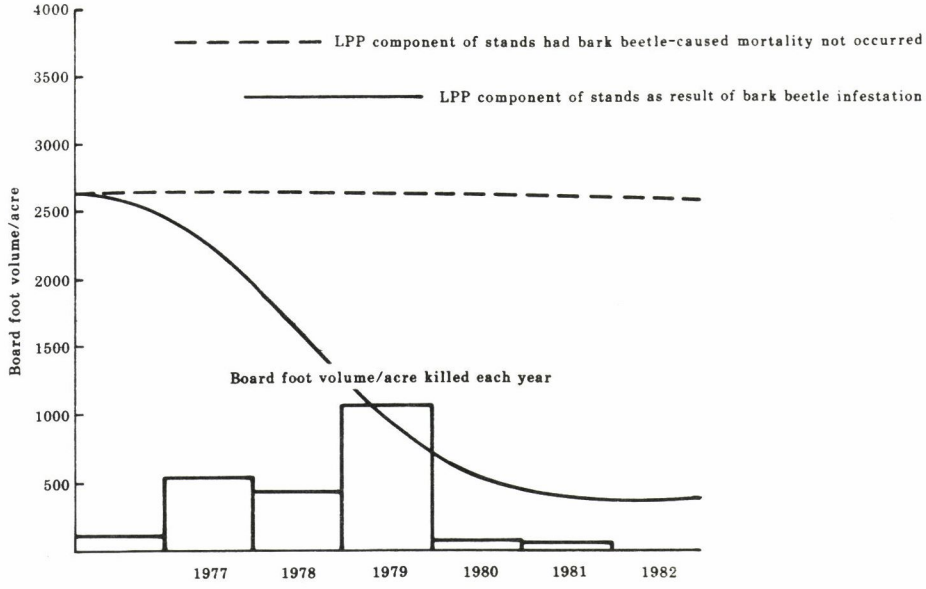
Table 1.--Permanent mountain pine beetle trend plots in Montana--1977 through 1984. Mountain pine beetle-caused mortality in lodgpole pine.

		1984 attack	1983 attack	1982 attack	1981 attack	1980 attack	1979 attack	1978 attack	1977 attack	Older dead	Total MPB dead	Other bark beetle mortality (total)	Unknown mortality (total)	Total standing dead	Percent MPB caused	% original LPP comp killed
Centennial	T/A[1]	-	-[4]	0.0	5.5	8.9	47.8	13.5	9.9	4.2	89.8	37.4	11.5	138.7	65	43
Valley	BF/A[2]	-	-	0.0	41.1	44.9	1057.7	446.4	549.8	114.8	2254.7	68.2	-	2322.9	97	88
Madison	T/A	-	-[4]	0.0	4.2	5.6	8.8	14.9	4.2	3.8	41.5	38.8	12.1	92.4	45	34
River	BF/A	-	-	0.0	361.2	360.1	497.3	703.8	285.1	38.3	2245.8	127.6	60.4	2433.8	92	62
Murr	T/A	6.9	21.3	7.1	7.3	9.6	3.6	4.2	2.6	2.8	65.4	15.8	12.7	93.9	70	19
Creek	BF/A	553.6	1272.2	631.5	267.7	112.3	45.9	88.0	47.2	113.2	3131.6	155.9	297.0	3584.5	87	27
Boulder	T/A	-[3]	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.8	3.7	19.7	24.2	3	<1
Creek	BF/A	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	135.5	135.5	0	<1
Dunsire	T/A	12.4	4.1	0.9	0.5	0.0	0.6	0.0	0.0	0.0	18.5	5.1	26.0	49.6	37	9
Creek	BF/A	1231.1	370.0	114.2	53.2	0.0	121.8	0.0	0.0	0.0	1890.3	401.4	870.4	3162.1	60	16
Spotted	T/A	-[3]	0.0	0.5	1.2	0.7	0.0	1.0	0.3	1.9	5.6	15.8	35.1	56.5	10	2
Bear	BF/A	-	0.0	51.3	-	46.2	0.0	102.1	59.4	106.6	365.6	102.8	237.3	705.7	52	3

[1] T/A = Trees per acre ≥5 inches d.b.h.
[2] BF/A = Board foot volume per acre.
[3] Not visited in 1984.
[4] Logged prior to 1983 season.

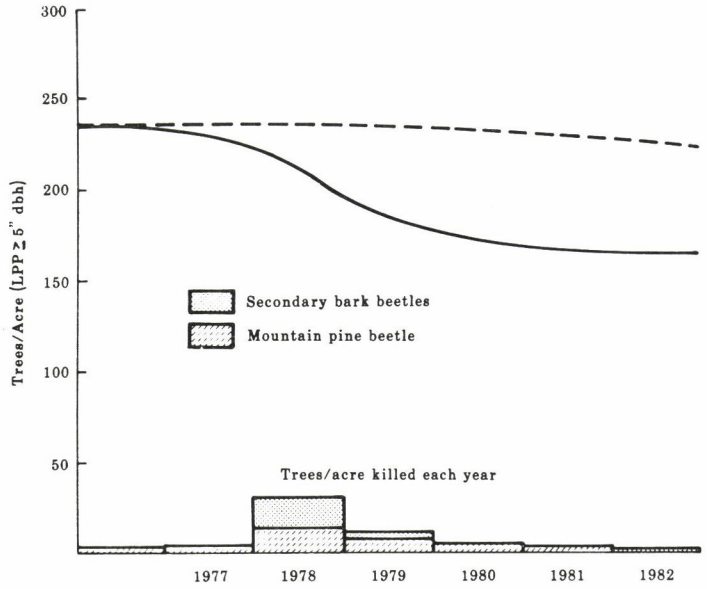


a. Trees per acre

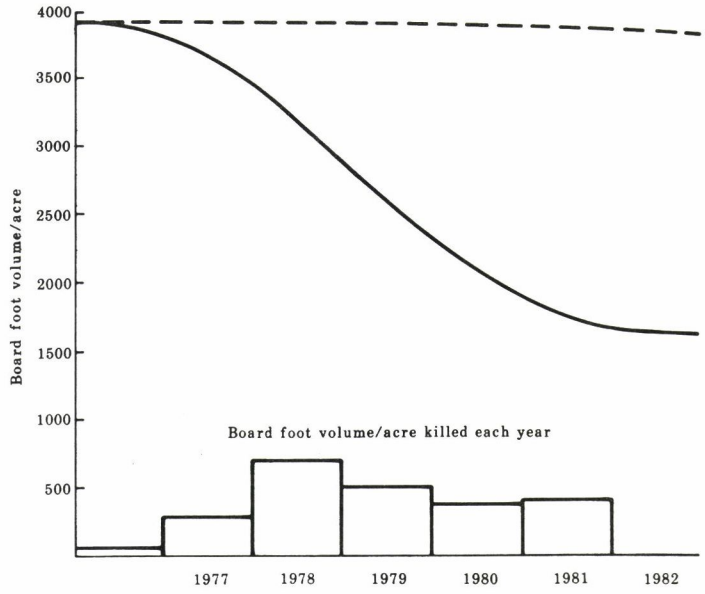


b. Board foot volume per acre

Figure 2. Effect of Bark Beetles on Centennial Valley Permanent Plots, 1977 - 1982



a. Trees per acre



b. Board foot volume per acre

Figure 3. Effect of Bark Beetles on Madison River Permanent Plots, 1977 - 1982

Table 2.—Permanent mountain pine beetle trend plots in Montana—following beetle flight, 1983. Mountain pine beetle-caused mortality in lodgepole pine.

Area		1983 attack	1983 strip	1983 pitchout	Total MPB mortality (to date)	Other bark beetle mortality (1983)	Unknown mortality (to date)	Total standing dead[1] (to date)	Percent MPB caused	% orig. LPP compon. killed by MPB (to date)	Remaining green LPP (≥5" d.b.h.
Murr	T/A	21.3	1.3	0.7	60.3[2]	0.4	10.0	70.7	85	18	264.2
Creek	BF/A	1272.2	101.6	47.5	3189.6	57.5	246.4	3493.5	89	27	8427.8
Boulder	T/A	0.0	0.0	0.3	0.8	0.0	15.3	15.3	5	<1	274.7
Creek	BF/A	0.0	0.0	59.4	-	0.0	346.1	346.1	0	<1	9478.1
Dunsire	T/A	4.1	0.5	0.0	8.5[2]	0.4	20.6	41.5	20	4	160.2
Creek	BF/A	370.0	54.8	0.0	886.3	57.0	691.8	2198.7	40	7	10050.3
Spotted	T/A	0.0	0.0	0.9	6.8[2]	0.6	32.3	50.4	13	2	226.1
Bear	BF/A	0.0	0.0	41.7	433.3	51.3	739.2	1515.1	29	3	12185.8

[1] "Total standing dead" is Total mountain pine beetle, Other, and Unknown mortality, still standing, for all years. Total may decrease from previous years. As dead trees fall or are cut, they are removed from stand totals.

[2] "Total MPB mortality" is corrected to 1983. In 1982, keypunch errors resulted in erroneous totals.

Table 3.—Permanent mountain pine beetle trend plots in Montana—following beetle flight, 1984. Mountain pine beetle-caused mortality in lodgepole pine.

Area[1]		1984 attack	1984 strip	1984 pitchout	Total MPB mortality (to date)	Other bark beetle mortality (1984)	Unknown mortality (to date)	Total standing dead[2] (to date)	Percent MPB caused	% orig. LPP compon. killed by MPB (to date)	Remaining green LPP (≥5" d.b.h.)
Murr	T/A	6.9	0.8	2.9	65.4	1.0	12.7	91.0	72	19	258.1
Creek	BF/A	553.6	46.1	192.6	3131.6	41.1	297.0	3740.4	84	27	7868.3
Dunsire	T/A	12.4	2.5	3.8	18.5	0.6	26.0	54.5	34	9	142.9
Creek	BF/A	1231.1	208.7	127.8	1890.3	48.8	870.4	3168.8	60	16	8560.3

[1] Because no new attacks had been observed in 1983, Boulder Creek and Spotted Bear plots were not visited in 1984. They will be checked again in 1985.

[2] "Total standing dead" is Total mountain pine beetle, Other, and Unknown mortality, still standing, for all years. Total may decrease from previous years. As dead trees fall or are cut, they are removed from stand totals.

The infestation in and near the Dunsire Creek plots is continuing to expand. In the past 3 years, new attacks per acre increased from 0.9 in 1982, to 4.1 in 1983, and to 12.4 in 1984. This infestation, a part of the larger infestation affecting nearly all of the Tally Lake RD, should continue to build in the next few years as only 9 percent of the original lodgepole pine component has been killed. Though only 143 green trees per acre (5 inches d.b.h. or larger) remain, 112 of those exceed 7 inches d.b.h. Within the next decade, 41 additional trees per acre are predicted to be lost to the beetle.

To date, insufficient growth-rate/phloem-thickness data have been collected to make correlations between that information and beetle-caused mortality rates. Observations made with other bark beetles (Hard et al. 1983), mountain pine beetle in ponderosa pine (Eaton 1941, Sartwell and Dolph 1976) and a few in lodgepole pine (Shrimpton and Thomson 1983) suggest such relationships exist. If we are ultimately able to explain why beetle populations have built more slowly in some areas than we anticipated--and thereby make refinements in our hazard-rating systems for mountain pine beetle in lodgepole pine stands--these permanent plot areas will prove valuable beyond their original intent.

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